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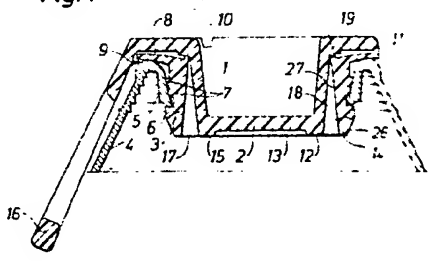
(54) **Cap.**

(57) The invention relates to a cap for containers intended for the keeping of pressurized contents. The cap consists of two parts, joined along a tearing indication, which in their lower edge zones are bridged by a disc of gastight aluminium foil, adapted so that it is torn up along an annular rupture line when the cap is opened.

Fig. 1



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C A P

The present invention relates to a cap for containers intended for the keeping of pressurized contents such as beer or refreshing beverages, which cap is adapted so that it can be fitted in and retained by the opening portion of the container, the said cap comprising two parts, namely an outer part and an inner part, the outer part whereof has a tubular body whose outside is provided with elements for the gastight joining to and fixing at the mouth part of the container, and whose inside forms a pouring channel for the pouring out of the contents present in the container, and the inner part consists of a stopperlike part inserted into the said pouring channel, which stopperlike part along its upper edge, along a thin, readily breakable, annular zone is joined to the upper edge of the outer part.

In the packaging of pressurized contents a need exists to provide a cap which for one thing is tight in respect of gases which are wholly or partially dissolved in the contents, in particular carbon dioxide, which secondly is mechanically so stable that it is retained without substantial deformation in the opening of the container, thirdly is relatively easy to open, and lastly is inexpensive to manufacture and easy to apply to the container.

The use has been known for a long time of screw caps, stopperlike caps of the cork type, and tear-off metal caps, in connection with bottles and other containers intended for pressurized contents. In particular for non-returnable containers of plastics it has been found, however, that the available known cap constructions are not satisfactory,

largely because of the elasticity of the plastic material. Thus it is difficult simply to use a stopper construction, the simplest variety of which is an ordinary bottle-cork, since contrary to a metal container or a glass container the mouth of a plastic container under the effect of pressure tends to yield elastically, so that a stopperlike cap is easily pushed out by the internal pressure prevailing in the container. The same is the case with tear-off metal caps of the known type, since the fitting of such caps requires a certain backing from the container mouth, and this backing as a rule is not present to a sufficient extent on thin-walled plastic containers. So-called screw caps have been used for the closing of plastic containers intended for pressurized contents, but such closures are relatively expensive, since the moulding of threads on the opening part of the plastic container is burdensome to perform and in any case diminishes the capacity in the manufacture of the containers. To solve this technical problem it has been suggested previously to use an injection moulded plastic cap of the same type in principle as that of the present application, this cap being adapted so as to be used in containers whose opening part has inwardly directed, flexible, annular lip of plastic material. Such a cap in principle consists of two parts which, however, are joined before the cap is opened along a thin, readily breakable, annular portion. To allow the said portion to be easily breakable it is necessary that the wall thickness within the portion in question should be small, and this in turn means that the gas permeability will be great, especially if the material itself is not particularly gastight (e.g. polyethylene). To solve this problem whilst retaining at the same time the advantages of the known cap, it has been proposed in accordance with the invention to provide a cap which is characterized in that the lower, preferably plane part of the stopperlike part is provided with an annular portion projecting from the stopperlike part, whose free edge is mainly located in the same plane as the lower edge zone of the outer part, the said lower edge zone of the outer part

as well as the said free edge of the annular portion of the stopperlike part being jointly covered by and fixed to a circular metal foil disc.

The invention is characterized further in a special embodiment in that the lower part of the outer tubular body is provided with an annular recess, whose diameter coincides with or slightly exceeds the diameter of the circular aluminium foil disc, this disc being adapted so that it is accomodated with its edge portion in the said recess, and a further embodiment in that the metal foil disc is coated on either side with a thermoplastic material, this coating layer in the edge zone of the metal foil disc being pressed out a little with the help of heat and pressure over the edge zone of the metal foil disc and induced to combine together by fusion, encapsulating at the same time the cut edge zone of the metal foil disc.

The invention will be described in the following with reference to the enclosed schematic drawing wherein

Fig. 1 shows a cross-section of a cap in accordance with the invention which is inserted in a container opening,

Fig. 1a shows a detail of the area ringed in fig. 1.

Fig. 2 shows a variant of the cap in accordance with fig.1 the sealing disc of metal foil being fitted into an annular recess, and

Fig. 2a shows a detail of the portion ringed in fig. 2.

In figure 1 is shown a cap of a type in accordance with the invention, which cap is fitted into a container 4 which has an opening whose mouth portion comprises an annular, inwardly directed lip 5. The container 4 can be made of glass, plastics or sheet metal and can be of optional shape with the exception of the inwardly directed lip 5.

The cap is made of an elastic material, preferably a thermoplastic such as polyethylene, and the most rational method for the manufacture of the cap consists in the application of a so-called injection moulding process.

The cap consists of a single coherent plastic part which comprises an outer tubular body 3 and an inner stopperlike part 1. The outer tubular body 3 is provided in its lower part with a hooklike flange 6 and in its upper part with a flexible flange 8 which is larger than the flange 6. On the outside of the tubular body 3 between the said flanges 6 and 8 sealing devices in the form of flexible, deformable sealing elements or projections 7 are arranged. The inside 27 of the tubular body 3 is adapted so as to form a pouring channel for the pouring out of the contents of the container 4 and the inside 27 may suitably be made slightly tapering so as to facilitate the manufacturing process of the cap. The inner, stopperlike part 1 can also be made with slightly tapering side walls and a suitable angle of inclination is 4°.

The stopperlike part 1, moreover, has a base 2 and a projecting portion 12 joined to the base 2 whose free end surface is designated 15. The stopper part 1 is joined along the thin and easily breakable circular portion 19 to the upper part of the tubular body 3, and it is also joined to the outer part of the flange 8 along a short connecting zone 11, which is situated opposite a gripping part 16 with a pull-ring, this gripping part being connected to a part of the edge zone of the flange 8. For the fastening of the stopperlike part 1 on the tubular body 3 after the connection 11 has been broken up, the gripping part 16 is provided with a catch 9 known in itself which is adapted so that it engages under the flange 8. The tubular body 3 and the projecting annular portion 12 of the stopperlike part 1 are in principle arranged with their lower edges in the same plane and are joined to one another

by means of a gastight disc 13, preferably of aluminium foil, which disc bridges the space 18 between the tubular body 3 and the part 1. To facilitate the fixing of the disc to the lower part 14 of the tubular body 3 and to the free surface 15 of the annular portion 12, the aluminium foil disc 13 is provided with a coating which has good adhesion to the aluminium foil disc 13, and which can be made to fix onto the cap along the surfaces 14 and 15, preferably through the application of heat with simultaneous exertion of pressure. Such a coating preferably may be constituted of a polyethylene layer, but it is also conceivable to use a so-called hot-melt, that is to say a melting glue or a hot-sealable varnish. Since the aluminium foil material is chemically attacked by acids which occur e.g. in fruit juices, it is necessary in certain cases to coat both sides of the aluminium foil disc 13 with thermoplastic material.

Owing to the concentric, annular fixing surfaces 14 and 15 for the aluminium foil disc 13 being relatively narrow, the energy required for the sealing operation can be substantially reduced.

If the area of the unsupported part 17 of the aluminium foil disc 13 is too large, the forces emanating from the pressure inside the container 4 onto this part of the disc 13 will become so great that the disc 13 can burst. This is a problem, especially within the area 17, since the volume of the wedge-shaped compressible space 18 is relatively large, whereas the problem does not arise to any appreciable extent in the central, unsupported portion of the aluminium foil disc 13, as the distance between the base 2 of the cap and the disc is small (approx. 0.5 mm) and the compressible volume of the space behind the disc 13 is consequently small.

It has been found that the thickness of the disc has to be

adapted to the size of the area 17, and for containers with an opening diameter of 20-25mm it has been possible to establish empirically that the ratio A between the inside diameter of the lower part of the tubular body 3 and the outside diameter of the annular portion 12 of the stopperlike part 1 should be between 1.2 and 2, preferably 1.25. Moreover, it has been possible to establish that the thickness T of the aluminium foil ought to be between 5 and 25μ, T having to be at least $5 + 10 \times A$ with a tolerance of $\pm$ 25%. Naturally any plastic coatings on the aluminium foil disc 13 will also to a certain extent contribute to its strength. However, the effect is not so great insofar as the occurrence of bursts in the aluminium foil is concerned, since the plastic material of the coating layers has a completely different modulus of elasticity from the aluminium material. This means that at a relatively small extension the aluminium foil disc 13 may already break, before the plastic coating, owing to its greater elasticity, has been able to make any significant contribution to the rupture strength of the aluminium foil disc.

The rules concerning the thickness of the aluminium foil given here are intended only to serve as a guideline in the dimensioning of the disc 13, and the dimensioning may be modified within relatively wide limits, taking into account such factors as the pressure in the container, the quality of the aluminium foil, the diameter of the container mouth etc.

After the filling of the container 4 with the intended contents, e.g. beer or carbonated fruit juice (so-called lemonade) the cap is pressed into the opening of the container, the lower tapered portion 26 of the outer tubular part 3 facilitating the guiding and introduction of the cap into the container mouth. As the cap is pressed in, the lower flange of the tubular body 3 will be pressed past, and, thanks to its flexibility, will snap over the lower edge

of the inwardly directed lip 5 of the container 4, at the same time as the upper flange 8 of the tubular body 3 will come to rest against the upper edge of the container mouth in such a manner that the inwardly directed lip 5 is firmly fixed between the flanges 3 and 8, at the same time as the outside of the lip 5 is pressed against the corresponding sealing element 7 of the cap. It is assumed that the container 4 is manufactured from a material of good gas barrier properties, in particular with regard to oxygen and carbon dioxide, e.g. glass, sheet metal or a relatively gastight plastic material, such as acrylonitrile plastic of the type which is marketed under the trade name BAREX or polyester (possibly with PVC coating).

As mentioned earlier it is most appropriate to injection-mould the cap in polyethylene material, which material unfortunately has, relatively speaking, poor gas barrier properties, and an injection-moulded polyethylene cap of the type shown in figure 1 causes large gas losses, especially along the thin, tearable portion 19, if the cap is not provided with any gastight cover disc 13. However, if a disc 13 of aluminium foil is fitted on the cap in the manner which has been specified, the gas leakage through the cap can be radically restricted and the contents in the container 4 are better protected against deterioration of quality, or in other words the shelf life of the package can be extended.

When the contents in the container are to be made accessible to the consumer, the gripping part 16 is pulled upwards and prized over the mouth of the container in that it is "folded" along the straight weakening groove 10 which is arranged transversely across the cap. Owing to the upper part of the cap being folded or brought down over the grove 10, the "forces for prizing open" are concentrated on that part of the breakable portion 19 which is situated between the gripping part 16 and the groove 10,which means that the initial tearing up of the

portion 19, which taken by itself requires force, is made easier. When the portion 19 has been torn up or broken up as far as the groove 10, the remaining part of the portion 19 is easily torn up at the same time as the disc 13 of aluminium foil is made to burst in the unsupported area 17, and the stopperlike part 1 is removed out of the emptying channel of the container which is formed by the inside of the annular part 3 remaining in the conainer mouth.

Owing to the part 1 being attached "hingelike" to the annular body 3 along the portion 11, the part 1 is not removed as an undesirable object of scrap, but can instead function as a guide to assist when the container is to be reclosed. This is made possible in that the inner part of the gripping part 16 is provided with a catch 9 which is adapted so that it can engage under the flange and retain the torn-up stopperlike part 1 in closing position. As mentioned, the aluminium foil disc 13 has to be protected in certain cases from making contact with the contents, because the taste of the contents may be affected by the metal and also because the metal foil disc may be eaten away acids occuring in the contents. In these cases it is often not sufficient to coat the aluminium foil disc 13 with an outer protective layer of plastic, but the free edges or cut edges of the aluminium foil layer, which in general are exposed when the aluminium foil discs are punched out of a sheet or weblike material, must also be protected.

A proposed solution of this technical problem is shown in fig. 2 and 2a (an enlargement of the ringed portion of fig.2). Apart form certain modifications of the cap in the area of the fixing of the aluminium foil disc 13 it is for the rest wholly in accordance with the description given earlier, and, for the sake of clarity, the same reference numerals to the drawing have been used in fig. 2 and 2a as in fig. 1.

In Fig. 2, with detail enlargement in fig. 2a, is shown how the lower portion of the tubular part 3 has been provided

as the thickness of the gastight disc 13, which in the case illustrated here comprises a central layer of aluminium foil 23 and outer coats 24 and 25 of thermoplastics. During the punching operation, the disc 13 has been given such a dimension that it can be inserted with its edge portion 21 with a relatively good fit, into the recess 20. In the fixing or sealing operation the foil disc 13 is pressed with simultaneous heating of the edge portion 21, (e.g. by means of high-frequency heating) against the inside of the recess 20. When this is done the plastic material 24, which may be constituted of polyethylene material, is fused together with the plastic material on the inside of the recess 20 so as to obtain a tight and mechanically durable join. At the same time plastic material is heated and pressed out from the lower part 28 of the annular body over the inner edge of the recess 20 and the edge zone of the disc 13, so that a thin plastic layer 22 bridges the edge zone of the disc 13 and is made to fuse together tightly with the outer plastic layer 25 of the disc 13. In the manner described the aluminium foil layer 23 of the disc 13 can thus be completely encapsulated and protected from contact with the contents.

It has been found, that at least in caps which have been subjected to pressure from pressurized contents over a prolonged period, the disc 13 is made to burst close to where it is fixed in the stopperlike part 1 when the cap is torn up. This is in general quite desirable, since a stopper part is obtained in this manner which is free from "flash" or projecting remains of the disc 13 when the stopperlike part 1 is withdrawn from the emptying channel. If desired, however, it is possible to direct the rupture line in the disc 13 by providing one or both of the plastic layers 24 or 25 with an incision or weakening line 27.

In fig. 1a is shown a further variation of a method for protecting the cut edge 29 of the aluminium foil disc 23.

It is assumed that the aluminium foil disc 23 in fig. 1a is covered on both sides with a coating of thermoplastic material 24 and 25 (e.g. polyethylene), and the plastic layer 24 is sealed in the manner as described previously to the underside of the annular body 3 in the region 14. In accordance with fig. 1a, the cut edge 29 of the aluminium foil disc 23 is protected by heating the edge portion of the gastight disc 13 in conjunction with the sealing operation. The plastic coatings 24 and 25 in the edge zone of the disc are thereby made to melt and are caused by means of a compression jaw to flow out over the cut edge 29 of the aluminium foil disc 23 so that the latter is wholly "baked in" or enclosed along the whole of its perimeter by the edge portions of the coatings 24 and 25 joined to one another in the area 30 by fusion. It is possible to achieve this effect because under the influence of heat the plastic material can be pressed out easily over the edge of the aluminium foil disc 23, whereas the aluminium foil layer itself is not deformed.

By the use of the cap in accordance with the invention, the gas tightness of known caps can be greatly improved whilst the price of the function of the cap are not affected to any appreciable degree.

Tetra Pak International AB
Rig 336-100

HJM/he

C L A I M S

1. A cap for containers intended for the keeping of pressurized contents such as beer or refreshing beverages, which cap is adapted so that it can be fitted in and retained by the opening portion of the container, the said cap comprising two parts, namely an outer part and an inner part, the outer part whereof has a tubular body whose outside is provided with elements for the gastight joining to and fixing at the opening portion of the container and whose inside forms a pouring channel for the contents enclosed in the container, and the inner part consists of a stopperlike part inserted into the said pouring channel, which stopperlike part along its upper edge, along a thin, readily breakable, annular zone is joined to the upper edge of the outer part,
characterized in that
the lower, preferably plane part of the stopperlike part is provided with an annular portion projecting from the stopperlike part, whose free edge is mainly located in the same plane as the lower edge zone of the outer part, the said lower edge zone of the outer part as well as the said free edge of the annular portion being jointly covered by and fixed to a circular disc of metal foil.

2. A cap in accordance with claim 1,
characterized in that
the stopperlike part is of a slightly tapered shape
with a side angle exceeding 4°

3. A cap in accordance with claim 2,
characterized in that
the space between the inside of the tubular body and the outside of the stopperlike part is annular and has a substantially wedge-shaped profile.

4. A cap in accordance with claim 1,
characterized in that
the ratio A between the inside diameter of the lower part of the tubular body and the outside diameter of the annular portion of the stopperlike part is between 1.2 and 2, preferably 1.25.

5. A cap in accordance with claim 4,
characterized in that
the said disc of metal foil is constituted of aluminium foil of a thickness R of between 5 and 25 µ, T being at least equal to $5 + 10 \times A$.

6. A cap in accordance with claim 5,
characterized in that
the aluminium foil disc is coated on one side or on both sides with a thermoplastic material, preferably polyethylene.

7. A cap in accordance with claim 6,
characterized in that
an annular groove or weakening is arranged in the polyethylene coating of the aluminium foil disc along a desired rupture line.

8. A cap in accordance with claim 1,
characterized in that
the lower part of the tubular body is provided with an annular recess whose diameter coincides with or slightly exceeds the diameter of the circular aluminium foil disc which is adapted so as to be accomodated with its edge portion in the said recess.

9. A cap in accordance with claim 8, characterized in that the outer free edge of the aluminium foil disc is enclosed in the recess by virtue of the plastic material in the lower part of the tubular body having been deformed and pressed in over the edge zone of the aluminium foil disc in conjunction with the fixing of the aluminium foil disc.

10. A cap in accordance with claim 6, characterized in that both sides of the aluminium foil disc are coated with thermoplastic material, these thermoplastic coatings being joined together in the edge zone of the aluminium foil disc by fusion in such a manner that the cut edge of the aluminium foil disc is enclosed by the plastic coatings joined to one another along the whole edge zone of the disc.

Fig. 1

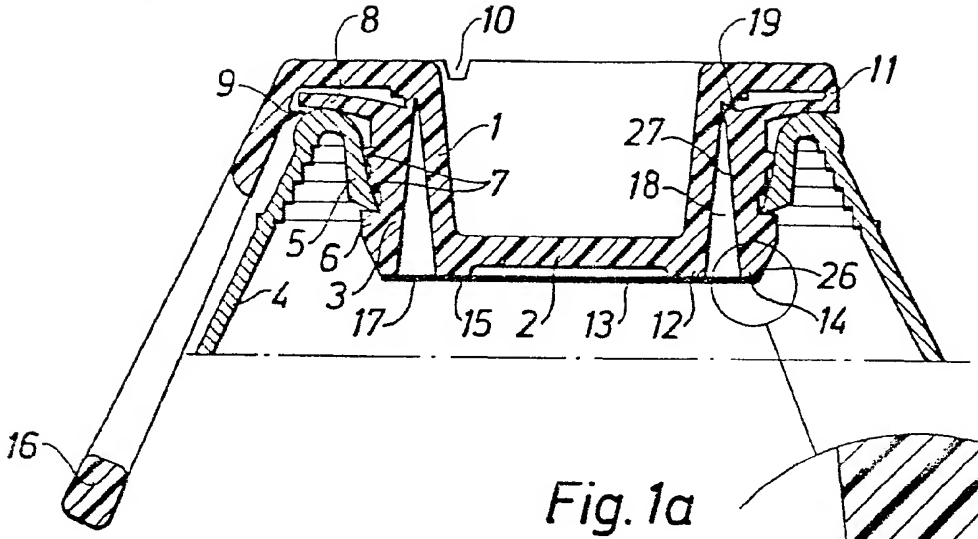


Fig. 1a

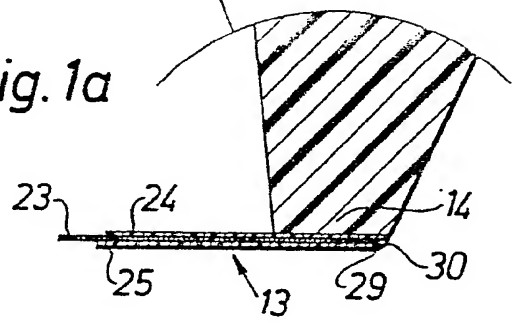


Fig. 2

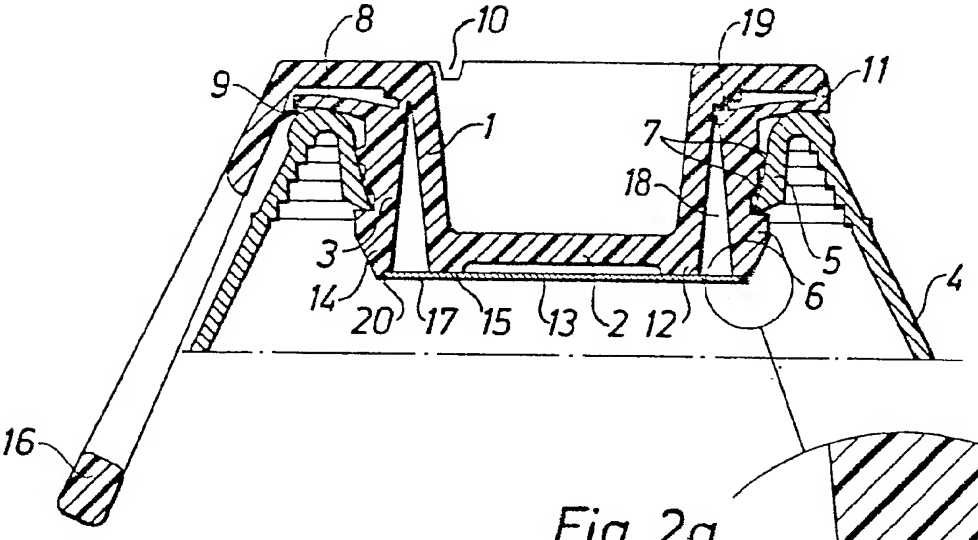
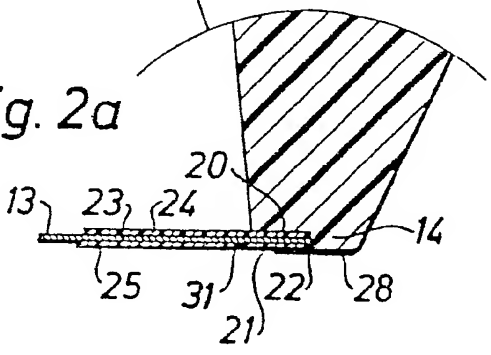


Fig. 2a



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EUROPEAN SEARCH REPORT

0046922
Application number
EP 81106405.4

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim
X	CH - A5 - 613 172 (TETRAPAK) * Claims 1,5,6; fig. 3,5,6 * & GB-A-1 524 344 --	1-4
	AT - B - 351 383 (METALLKAPSEL-FABRIK LOOS) * Claims 1,3 * --	5,6
A	AT - B - 115 300 (KORESKA) * Claims; fig. * --	1,7
A	US - A - 1 867 637 (WARTH) * Page 2, lines 18-20,66; fig. 1,2,4 * --	1,6,10
A	DE - C - 719 521 (DANSK) * Claim 1; fig. 1 * --	1,8,9
A	US - A - 2 078 132 (FERGUSSON) * Fig. 3 * ----	1,8

CLASSIFICATION OF THE APPLICATION (Int Cl.³)

B 65 D 41/50

TECHNICAL FIELDS SEARCHED (Int Cl.³)

B 65 D 39/00
B 65 D 41/00
B 65 D 47/00
B 65 D 51/00
B 65 D 53/00

CATEGORY OF CITED DOCUMENTS

X: particularly relevant
A: technological background
O: non-written disclosure
P: intermediate document
T: theory or principle underlying the invention
E: conflicting application
D: document cited in the application
L: citation for other reasons

&: member of the same patent family, corresponding document

X The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
VIENNA	11-11-1981	TROJAN

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